

Enhanced ORCA and CLARREO Depolarizers Using AR Microstructures, Phase I

Completed Technology Project (2011 - 2011)



Project Introduction

Next generation Earth Science Satellites ORCA and CLARREO are designed to measure our planet's ocean and climate health. Using hyper-spectral imaging at wavelengths ranging from the UV through NIR, these instruments will record the levels of the earth's temperature rise over the course of a decade. To make such detailed measurements, polarization effects at various wavelengths due to multiple factors must be eliminated using an optical device known as a "de-polarizer". For the CLARREO de-polarizer, four quartz windows are needed to randomize the polarization state of the observed reflected light spectrum. Multiple reflections from 4 surfaces produce losses up to 14% of the incident light, a level high enough to produce "ghost" effects superimposed on the desired earth images resulting in reduced image contrast and greater measurement error. An anti-reflection (AR) treatment is needed that can withstand the radiation and temperature effects caused by the mission environment while reducing reflection losses to levels of fractions of one percent. A new type of AR treatment, being developed for many military and commercial applications, is based on surface relief microstructures fabricated directly in a window, optic, or sensor material. AR microstructures (ARMs) can suppress internal reflections to levels unattainable by conventional thin-film AR coating technology. To extend the performance benefits of ARMs to hyper-spectral imaging systems, it is proposed that the fabrication processes developed for fused silica, glass, silicon, and many other optical materials be adapted for use with the quartz and magnesium fluoride depolarizers planned for the ORCA and CLARREO missions. In addition, an investigation of innovative surface microstructure technology is proposed for the fabrication of a new type of non-scattering, micro-textured depolarizer with inherent AR properties that can be applied to multiple optical elements within a spectrometer system.



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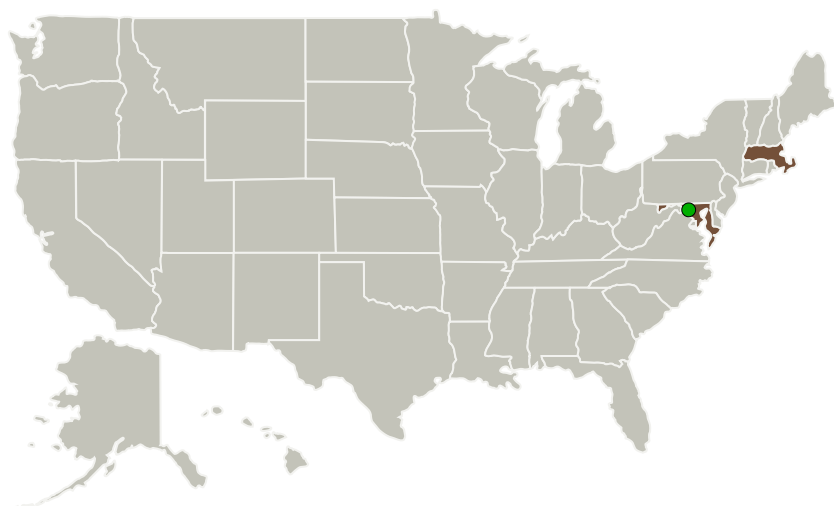
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
TelAztec	Lead Organization	Industry	Burlington, Massachusetts
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Massachusetts

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138137>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TelAztec

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

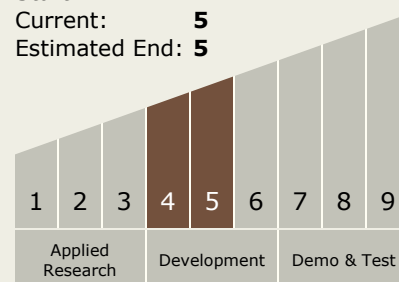
Carlos Torrez

Principal Investigator:

Douglas S Hobbs

Technology Maturity (TRL)

Start: **4**
 Current: **5**
 Estimated End: **5**



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.6 Human Systems Integration
 - └ TX06.6.1 Human Factors Engineering

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System